Claims:

1. A powderous electrode active material of lithium transition metal oxide $Li_aM_bO_2$

- where $0.9 < a < 1.1$, $0.9 < b < 1.1$ and M is dominantly transition metal chosen from Mn, Co and Nickel
- having particles with a distribution of sizes
- where the composition M varies with the size of the particles

2. The powderous material according to claim 1, having a broad particle size distribution specified that the size ratio of large to small particles exceeds 2, $d90 / d10 > 2$ where d90, the size of large particles is defined that particles with larger size constitute a fraction of 10% of the total mass of the powder and d10, the size of small particles is defined that particles with smaller size constitute a fraction of 10% of the total mass of the powder.

3. The powderous material according to claim 1, where $M = A_zA'_{z'}M'_{1-z-z'}$, $M' = Mn_xNi_yCo_{1-x-y}$, $0 \leq y \leq 1$, $0 \leq x \leq 1$, $0 \leq z+z' < 0.1$, $z' < 0.02$, A is a metal chosen from Al, Mg, Ti, Cr and A' is a further minor dopant chosen from F, Cl, S, Zr, Ba, Y, Ca, B, Be, Sn, Sb, Na, Zn.

4. The powderous electrode active material according to claim 1, wherein the particles have a layered crystal structure.

5. A powderous electrode active material of lithium transition metal oxide $Li_aM_bO_2$

- where $0.9 < a < 1.1$, $0.9 < b < 1.1$ and M is transition metal chosen from Mn, Co and Nickel
- the particles have a layered crystal structure
- having a broad particle size distribution with $d90 / d10 > 2$
- where the composition M varies with the size of the particles

6. The powderous electrode active material of $Li_aM_bO_2$ with size dependent composition according to claim 5, wherein the averaged transition metal composition is $M=Mn_xNi_y(Co_{1-x-y})$ with $0.35 > x > 0.03$

7. The powderous electrode active material of $Li_aM_bO_2$ with size dependent composition according to claim 5, wherein the averaged transition metal composition is $M=Mn_xNi_y(Co_{1-x-y})$ with $x>0.03$ and $x+y<0.7$

8. The powderous electrode active material of $Li_aM_bO_2$ with size dependent composition according to any one of the claims 1-4 or 5-7, where basically all bulk of all particles has a layered crystal structure, larger particles having a composition $Li_aM_bO_2$ where $M=Mn_xNi_y(Co_{1-x-y})$ with $x+y<0.35$ and smaller particles having a different composition $Li_aM_bO_2$ where $M=Mn_{x'}Ni_{y'}(Co_{1-x'-y'})$ with at least 10% less cobalt $(1-x'-y') < 0.9*(1-x-y)$ and at least 5% more manganese $x'-x>0.05$

9. The powderous electrode active material according to claim 8, wherein larger particles, specified by having a size larger than d50 - these larger particles comprise a mass fraction exceeding 50% of the total mass of the powder - have a different composition in the inner bulk and the outer bulk.

10. The powderous electrode active material according to claim 9, wherein the inner bulk of larger particles has a composition $Li_aM_bO_2$ where $M=Mn_xNi_y(Co_{1-x-y})$ and $x<0.2$

11. The powderous electrode active material according to claim 9, wherein the inner bulk of larger particles has a composition $Li_aM_bO_2$ where $M=Mn_xNi_yCo_{1-x-y}$ with $x+y<0.2$

12. The powderous electrode active material according to claim 9, wherein the inner bulk of larger particles has a higher stoichiometry of cobalt and a lower stoichiometry of manganese than the outer bulk

13. The powderous electrode active material according to claim 5, wherein the composition M varies continuously with the size of the particles.

14. The powderous electrode active material according to claim 1 or 5, where the Co stoichiometry of single particles continuously increases with the particle size.

15. The powderous electrode active material according to claim 1 or 5, where the Mn stoichiometry of single particles continuously decreases with the particle size.

16. The powderous electrode active material according to claim 15, wherein the manganese stoichiometry is proportional to the inverse of the radius of the particle.

17. The powderous material according to claim 1 or 5, which is used as cathode active material in a rechargeable lithium batteries

18. A method for preparing the powderous electrode active material of claim 1 or 5, the method comprising the steps of:

precipitating at least one transition metal containing precipitate onto seed particles, which have a different transition metal composition than the precipitate;

adding a controlled amount of a source of lithium ; and

performing at least one heat treatment.

wherein basically all obtained particles contain a core, originating from a seed, completely covered by a layer originating from precipitate.

19. The method according to Claim 18, wherein the precipitate contains manganese, and the seeds dominantly are monolithic particles chosen from $LiCoO_2$ or $LiMO_2$ where M is transition metal $M=Mn_xNi_yCo_{1-x-y}$, where $x<0.25$ and $y < 0.9$

20. The method according to Claim 19, wherein at least 40 w% of the transition metal of the precipitate is manganese.

21. The method according to Claim 19, wherein the outer layer originating from the precipitate contains further at least one metal element chosen from Al, Mg, Ti, Zr, Sn, Ca and Zn.

22. The method according to Claim 18, wherein the heat treatment is made in air, the temperature being within the range from 750 to 1050°C.